

REMARKS

In the present amendment, claims 1-7 have been amended and claim 9 has been cancelled. Accordingly, claims 1-8 and 10-19 are pending in the application, with claims 1 and 7 being independent.

Applicants note that claims 1 and 7 have been amended to clarify language by reciting a "styrene-modified polyolefin-based resin." Support for the amendment can be found in the originally filed specification, e.g., at page 4, lines 7-9.

Moreover, claims 1 and 7 have been amended to recite a range of styrene-based monomer forming a polystyrene-based resin in the beads of 120 to 1,000 parts by weight relative to 100 parts by weight of a polyolefin-based resin. This amendment is supported in the specification, e.g., at page 7, lines 15-19.

Furthermore, claim 7 has been amended by incorporating the subject matter of now cancelled claim 9 and reciting a range of 40-90% styrene-based monomer containing the polymerization initiator. This amendment is supported in the specification at least at page 23, first paragraph.

No new matter has been added.

Response to Rejection under 35 USC § 112, second paragraph

The Office Action rejects claims 1-19 under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite, asserting that the phrase "olefin modified polystyrene based resin" is not clear, because the specification teaches "polyolefin resin that is being modified with polystyrene" (see Office Action, page 2, paragraphs 1 and 2).

Applicants note that claims 1 and 7 have been amended to even further clarify the language therein by reciting “styrene-modified polyolefin-based resin”

With respect to claim 10, the Office Action alleges that “it is not clear how the amount of styrene not containing polymerization initiator can be as high as 60%, while the base claim requires 90% of the styrene monomer being added with the initiator.” In response, Applicants submit that base claim 9 has been merged with claim 7, and claim 7 has been further amended by reciting that a corresponding range of 40-90% styrene monomer is added with the polymerization initiator. Support for this amendment can be found in the specification, e.g., at page 23, first paragraph.

The Office Action further states with respect to claim 19, that it is unclear “what is used as a cushioning material. In response, Applicants respectfully refer to the present specification at page 28, lines 18-24, wherein the use of the expanded molded article is described. Applicants note that the term cushioning is a standard technical term with the meaning as can be understood by the synonym terms absorbing or damping.

Response to Rejection under 35 U.S.C. § 102/103

The Office action makes the following rejections under 35 U.S.C. 102(b) as allegedly being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as being obvious over:

- U.S. Patent No. 4,647,593 to Bartosiak et al., hereinafter “BARTOSIAK” with respect to claims 1-5, 7, 11, 13-14, 16-19;
- U.S. Patent No. 4,303,757 or 4,303,756 both to Kajimura et al., hereinafter “KAJIMURA” with respect to claims 1-5, 7, 11, 13-14, 16-19; and

- U.S. Patent No. 4,168,353 to Kitamori, hereinafter "KITAMORI" with respect to claims 1-7, 11-14, 16, 18-19.

Applicants respectfully traverse the rejections. Applicants submit that in order to advance prosecution and without expressing agreement with or acquiescence to the rejection, claim 7 has been amended by incorporating the subject matter of not rejected claim 9, now cancelled. Applicants note that the method for producing the styrene-modified polyolefin-based resin of present claim 7 clearly distinguishes over the methods disclosed in the art cited by the Office Action, i.e., BARTOSIAK, KAJIMURA and KITAMORI. The presently claimed method employs that the styrene-based monomer is added in two steps: first, in combination with polymerization initiator and second, without the addition of the initiator (see Figure 1, below).

dispersing (EVA beads 40 pbw
and water 100 pbw)

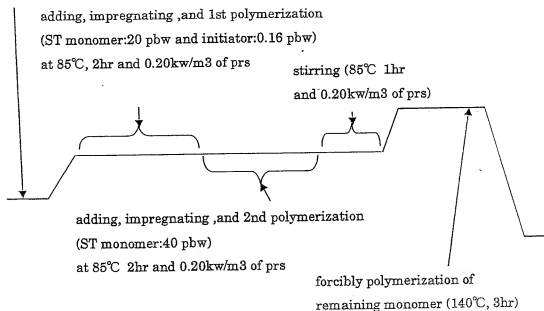


Figure 1: Example of reaction scheme of the present invention

In contrast to the presently claimed invention, BARTOSIAK, KAJIMURA and KITAMORI disclose methods wherein the styrene monomer and the polymerization initiator are simultaneously impregnated with polyolefin-based resin beads (see Figure 2, below). There is no teaching or suggestion in BARTOSIAK, KAJIMURA and KITAMORI of adding a step wherein styrene-based monomer is added without polymerization initiator.

dispersing (PP copolymer beads 200 pbw
and water 100 pbw)

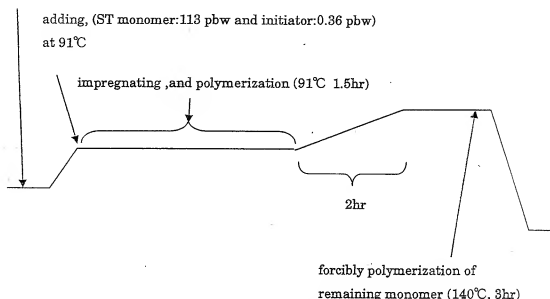


Figure 2: Reaction scheme taught in BARTOSIAK: both styrene monomer and a polymerization initiator are simultaneously impregnated with polypropylene copolymer bead

Applicants further point out that the production method of the present invention is performed by the unexpectedly finding that by reduction of the power required for stirring below the conventional power, expressed in "prs," an uneven localization of the polystyrene in the polyolefin-based resin may be obtained, see present specification page 16, line 14 to page 19, line 6.

Applicants further note that the method of present claim 7 leads to the pre-expanded beads of styrene-modified polyolefin-based resin as recited in present claim 1, having unique properties compared to known products of this type. Applicants respectfully disagree with the Examiner's conclusion that the particles produced in the examples of BARTOSIAK, KAJIMURA and KITAMORI "are inherently of the same properties" as presently claimed. For example, the method of the present invention leads to resin beads wherein "the polystyrene-based resin is rich at a central part rather than around a surface" (see present specification, page 22, line 23-25). In contrast, the polyolefin-modified expansion particles known in the art have a uniform distribution of the polystyrene throughout the particles, see, e.g., KITAMORI, column 5, lines 25-35. Indication for an uneven distribution of the polystyrene in the particles of the presently claimed invention is a low absorbance ratio absorbance ratio at 698 cm^{-1} and 2850 cm^{-1} (D_{698}/D_{2850}) as recited in claim 1, obtained from an infrared absorption spectrum of each bead surface measured by ATR method infrared spectroscopy, and being in the range of 0.1 to 2.5. Applicants refer to the Examples of the present specification (see summary in Tables 1-3, pages 50-52 of the present specification), which demonstrate that the modified beads with an absorbance ratio in the range of present claim 1 possess much better chemical resistance against gasoline, kerosene and DBP as well as a higher impact resistance than the products of the Comparative Examples that were produced according to the methods commonly used in the art.

A demonstration of the differences between the product of the present invention and the art cited by the Office Action is shown in Figure 3 below: A) demonstrates how the styrene-based monomer containing the polymerization initiator can be polymerized in

a central part of the polyolefin-based resin bead in the first polymerization step. B) shows how the styrene-based monomer which does not contain the polymerization initiator is polymerized in the second polymerization step while impregnating with the polystyrene-based resin component obtained in the first polymerization step. C) shows the product obtained by the methods taught in BARTOSIAK, KAJIMURA and KITAMORI, wherein the styrene monomer is homogeneously distributed and polymerized in the polyolefin bead.

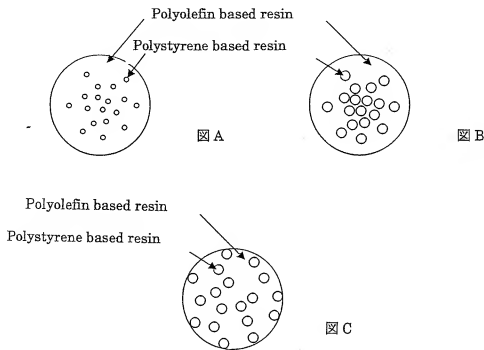


Figure 3: Schematic comparison of modified beads of present invention A) and B) with cited art C)

In view of the amendments of the claims and above presented arguments, Applicants respectfully request withdrawal of the rejections under 35 U.S.C. § 102/103 over BARTOSIAK, KAJIMURA and KITAMORI.

Response to Rejections under 35 U.S.C. § 103

The Office Action makes the following claim rejections under 35 U.S.C. § 103(a):

- claims 8-10 and 15, as allegedly being obvious over BARTOSIAK;
- claims 8-10 and 15, as allegedly being obvious over KITAMORI; and
- claim 15, as allegedly being obvious over KAJIMURA.

The Office Action admits that BARTOSIAK and KITAMORI do not “disclose the specific amounts of styrene added at any stage of polymerization,” however asserts that BARTOSIAK and KITAMORI contain teaching that “monomer and catalyst (initiator) can be added together or separately, all at one or in increments” (see Office Action, page 8, lines 6-8). In response, Applicants note that the general teachings in BARTOSIAK and KITAMORI would not have been guided one skilled in the art to make pre-expanded beads of styrene-modified polyolefin-based resin in accordance to the presently claimed invention. KITAMORI clearly teaches that the catalyst is mixed together with the styrene monomer (see KITAMORI, Examples 1-3) leading to “polyethylene resin particles containing the polystyrene resin uniformly dispersed therein ...” (see KITAMORI, column 5, lines 28-30). Moreover, Example 1 in BARTOSIAK teaches that catalyst solution and styrene monomer were added all at once to the polypropylene pellets, there is no disclosure that the way of adding the styrene monomer would influence the outcome of the product. Accordingly, the teaching in BARTOSIAK and KITAMORI would not have been motivated someone skilled in the art to develop the method and product of the presently claimed invention. There is also no recognition in BARTOSIAK and KITAMORI that changing the distribution of the polystyrene in the

polyolefin bead or pellet would lead to products with improved properties such as, e.g., chemical resistance and impact strength.

In view of above presented arguments, withdrawal of the obviousness rejections of claims 8-10 and 15 over BARTOSIAK and KITAMORI are respectfully requested.


Concerning the obviousness rejection of claim 15 over KAJIMURA, Applicants note that this rejection is based on the assumption that claim 7 is anticipated / obvious over KAJIMURA. As discussed above, claim 7 has been amended to include the elements of not rejected claim 9. Since claim 15 ultimately depends from claim 7, withdrawal of this rejection is respectfully requested.

CONCLUSION

In view of the foregoing amendments and remarks, the Examiner is respectfully requested to reconsider and withdraw the rejections of record, and allow each of the pending claims.

If any issues yet remain which can be resolved by telephone, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully Submitted,
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